REDUCING YOUR TRANSPORTATION ENERGY USE

Transportation accounts for 31 percent of the energy used in Virginia – more than the residential, commercial, or industrial sectors – and a whopping 76 percent of total petroleum use. Sixty-four percent of the energy used for transportation is gasoline for cars and light trucks, at a total cost of nearly $7 billion in 2000. Both highway use and average annual expenditure for transportation in Virginia have been increasing rapidly in recent years.

While the statewide trend is up-up-up in terms of energy use and cost for transportation, it's not hard to buck the trend. With practice and common sense, you can achieve 10 percent fuel savings just by improving your driving habits and keeping your car properly maintained. Far greater savings can be realized by changing your habits and driving less – by using public transportation, carpooling or riding a bicycle. And when it comes time to buy a new car, savings can also be achieved by selecting a fuel efficient vehicle.

This section presents a series of practical suggestions and tips for saving energy and money with transportation.

Driving Tips

Minimize Idling

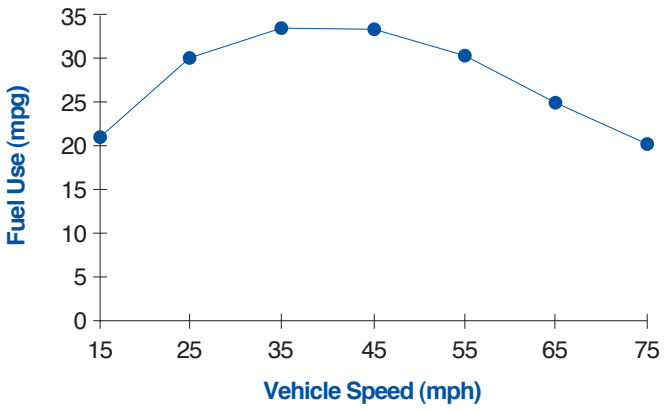
A cold engine should be warmed up by idling for about 30 seconds. Longer idling time during warmup is generally not warranted. In other situations, be aware that idling wastes energy. When you stop the car to run an errand for longer than a minute or two, turn the car off. If there is a line at the drive-up bank or fast-food window, park and walk in rather than sitting in line with the car idling. When idling, you are getting 0 miles per gallon.

Avoid quick acceleration

Accelerating from a stop requires a lot more energy than steady cruising. When you accelerate too quickly, more fuel is delivered to your engine than can be burned, wasting energy. For the most energy-efficient driving, accelerate through the gears at a moderately brisk pace, then maintain steady speeds.

Observe speed limits

Most vehicles achieve their highest fuel economy at speeds of 35 to 50 mph. At speeds above this range, fuel economy is significantly reduced because of wind resistance. According to the U.S. Department of Energy, for every one mile per hour above 55 mph, fuel economy of the average vehicle drops two percent. A car that averages 30 mpg at 55 mph, for example, will only get about 27 mpg at 60 mph, and only 21 mpg at 70 mph.



Average of fifteen American and imported cars, model years 1981-1984.
Source: US Dept. of Energy

Figure 11-1 - This chart of fuel use and vehicle speed shows how rapidly gas mileage drops as your speed increases over 50 mph.

Anticipate traffic

You can save a lot of energy by paying attention to the road and traffic ahead of you. If you see a stop sign coming up, for example, take your foot off the accelerator and coast as you approach it. By coasting as you approach a red light, it may turn green before you come to a full stop, saving energy on the acceleration.

Use Cruise Control

When highway traffic is light enough, use cruise control. Cruise control gives a steady application of the

gas pedal that results in better mileage. For safety reasons, do not use cruise control in heavy traffic, on curvy roads, or in slippery conditions.

Use Air Conditioning Wisely

When starting off in a car that has been parked in the sun with the windows closed, drive with the windows open for the first couple of minutes before closing the windows and turning on the air conditioning. This allows the very hot air to be blown out the windows, making the car cool off more quickly and saving energy.

At low speeds in moderate weather, riding with the windows open gives you better gas mileage than closing the windows and running the air conditioning. At highway speeds, however, riding with the windows open increases the car's air resistance. The increased engine power to overcome that resistance is about equal to the power required to run the air conditioner, so using the air conditioner has little effect on gas mileage.

Avoid Drive-in Window Lines

Banking, dropping off laundry, or buying food at a drive-in window makes sense when you can drive to the window, quickly complete your transaction, and drive off. When you must wait in a line with other idling vehicles, however, using a drive-in is a waste of fuel and a source of pollution. Besides, a long wait using the drive-in doesn't save much time.

Automobile Maintenance

Keep your car tuned up

A tune-up can save a lot of fuel, as much as 10 percent or more, depending upon the operating condition of your vehicle. You will know it's time for a tune-up when:

- Your mileage drops for no apparent reason.
- Your vehicle fails an exhaust emission or other diagnostic test.
- The engine skips, sputters, stalls, or smoke comes out of the exhaust.

Keeping a simple mileage log will help you identify when you need a tune-up or when some other problem is reducing your fuel economy (under-inflated tires, etc.). All you need is a card or sheet of paper for writing down your odometer reading and how much gas you put into the tank each time you fill up. If you notice a drop in the mileage, for the last three fill-ups, then something might be wrong, and you should have it checked out. Keep in mind that stop-and-go driving conditions, under-inflated tires, cold weather, and other factors may also affect your mileage.

Maintain proper tire pressure

Underinflated tires reduce fuel economy by about 1% for every 2 pounds of underinflation, because of increased rolling resistance.

Inflate your tires to the pressure shown on the information plate on the frame of the driver's door. Do not inflate tires to the pressure shown on the tire sidewall. Though the sidewall pressure gives maximum tire load capacity and best gas mileage, the pressure shown on the

MILEAGE LOG

Date	End Miles	Miles Driven	Gallons to refill	Miles per gallon	City/ highway
Example	45,700	200	10	20	city

information plate also considers your car's stability, traction, and handling. Inflating tires to a pressure different from that shown on the information plate may reduce vehicle safety.

Recommended tire pressures are "cold inflation" pressures, so you should check your tire air pressure when the tires have not been heated by driving. If you must drive over a mile for air, use a tire pressure gage to check pressure before you leave home and when you get to the service station. Then reduce your inflation pressure by the pressure increase caused by heating. In any case, it is best to use your own tire pressure gage to check your inflation pressure: the gages on service station air pumps are often inaccurate.

Keep your car's front end properly aligned

Misalignment of wheels increases tire wear and can reduce your mileage.

Buy tires wisely

Each tire you buy has a size marked on its sidewall such as "P215/65R15" or ""LT235/85B16". The beginning letters are "P" for passenger or "LT" for light truck, while the letters near the end are "R" for radial or "B" for bias ply. The remaining numbers give the tire size. When replacing your tires you should always use the same size as the original equipment unless the change has been approved by the car's manufacturer. If you have an older car with bias ply (B) tires, however, you should switch to radial (R) tires. Radial tires give better handling and increased gas mileage. One caution: when changing from bias ply to radial tires, you should replace all the tires on the car simultaneously or you may have handling problems.

Following the size marking is a speed-load rating such as "89S" or "75H". The numbers give the load rating of the tire: the higher the number, the higher the load-carrying ability. The letter gives the speed rating of the tire: speed rating increases according to the sequence S-T-U-H-V-W-Y, with letters later in the sequence having a higher speed rating. When replacing your tires you should always buy at least the speed and load rating of the original equipment.

Also on the tire sidewall you will find ratings for treadwear (a number, the higher the better), traction (a letter in the sequence AA-A-B-C, with AA being the best), and temperature (a letter from A to C, with A being the best). When replacing your tires you should always buy at least as good a traction and temperature rating as the original equipment.

There are certain tradeoffs in tire design. A harder, more rigid rubber will generally give higher gas mileage and longer life. A softer rubber will generally give better traction and performance. If you buy "high performance" tires you may find that your mileage goes down. If you buy "high mileage" tires you may find that your handling and traction suffer. For saving energy and maintaining safety, buy high mileage tires that still have at least as good a traction rating as the car's original equipment.

Don't buy higher-octane gasoline than is recommended for your car

Most cars today are designed to work well with regular unleaded gasoline (87 octane). Higher octane fuel doesn't contain any more energy than regular gas – its only function is to reduce knock. If your car doesn't knock with regular gasoline, use regular. If the owner's manual recommends regular gasoline but you have a knocking problem when using regular, have your car checked by a mechanic.

Besides costing you money, some of the octane-increasing additives used in premium gasoline are worse for the environment than the constituents of regular gasoline.

Change your oil regularly and use high-quality oil

Both the engine oil and oil filter should be changed at least as often as recommended in the owner's manual. When the motor oil is used for too long it deteriorates, increasing friction, increasing wear, and reducing fuel economy.

The lubricating quality for oil used in gasoline engines is classified by the letter "S" followed by one of the letters "A" through "J" (for example, "SH"). The later in the alphabet the second letter is, the better the oil will lubri-

cate. In general, use the highest quality (later letter) oil available. Your car owner's manual gives the oil rating for which the engine was designed, so never use oil with a lower quality (earlier letter) rating.

Your owner's manual also recommends an oil "weight" for your car, which indicates the oil's viscosity: the higher the number the more viscous ("heavier") the oil is. Single-weight oils (SAE 30, for example) can be of high quality, but their viscosity changes a lot as the temperature changes. A single-weight oil that gives adequate lubrication in a warmed-up engine may be so thick on a cold morning that the engine will not start. Multiple-weight oils (SAE 10-30, for example) perform like low-weight oils at low temperatures and like high-weight oils at high temperatures. In general, you should use the oil weight recommended in your owner's manual. Lower weight oil may not adequately protect your engine from wear, and higher weight oil will increase engine friction, wasting energy and making cold starts more difficult.

If you change the oil in your car yourself, take the old oil to a collection center so it can be recycled. This is important for three reasons: First, oil disposed of any other way can easily find its way into the ground and water supply, where a small amount of oil can contaminate a large reservoir. Second, used oil can be recycled into new motor oil using only 1/4 the energy needed to refine crude oil. Third, dumping waste oil is illegal and punishable by a fine.

Even though it is illegal in Virginia to dump used oil on any water, land or into the storm drain system, an estimated 6,000,000 gallons are disposed of improperly in the Commonwealth each year. If reprocessed, that amount of oil could heat more than 10,000 homes for an entire year. Many service stations, auto parts stores, and recycling centers display a "Return Used Oil Here" sign, indicating an oil recycling collection center. Please do your part by disposing of your oil properly.

When used motor oil is burned, the combustion

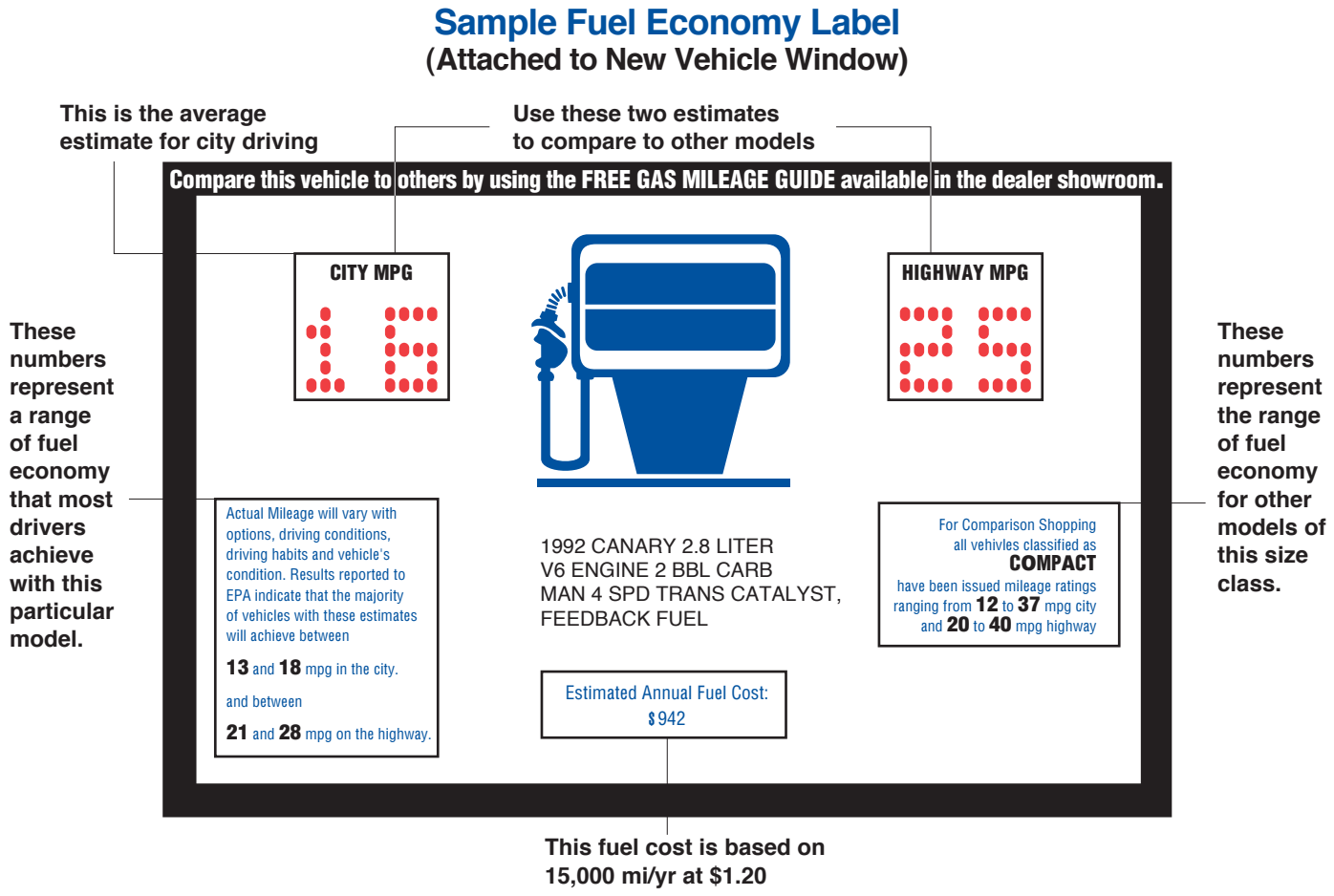


Figure 11-2 - The fuel economy label offers an easy way to compare the gas mileage of different vehicles.

products contain harmful pollutants from the oil additives and engine wear products. Used oil should not be burned in oil stoves or furnaces unless they are equipped with special pollution control equipment.

For information on how to recycle used motor oil in Virginia, check with your local recyling coordinator.

Take extra weight out of the car

An extra 100 pounds in your trunk can reduce mileage by a half mile per gallon. So if you've been carrying around your golf clubs, or still have a bag of sand in the car for winter traction even though it's now summer, take them out and boost your mileage – and performance.

Buying A New Vehicle

Choose a fuel-efficient vehicle

If you're thinking of buying a new car or truck, you're in an ideal position to make a big difference in your fuel use. Automobiles within any size class vary tremendously in their fuel economy. By choosing a car that gets just one mile per gallon more than another, you will save approximately $400 over the life of the car, assuming fuel prices stay about the same and your driving habits are average.

When selecting a car, be practical and realistic about your needs:

- Remember that you're buying transportation, not a toy. If you do demand a "fun to drive" car, you will find that many small, high mileage cars have excellent performance and handling.
- Size doesn't equate to safety. While heavy pickups and SUV's may be safer in a crash with a small vehicle, their size is no help in a crash with a tractor-trailer or a bridge abutment. Also, their poorer handling makes a crash or rollover more likely.
- Don't buy a car based on an infrequent need. If you drive off-road once or twice a year, do you really need an SUV? If you haul a load of mulch each spring, do you really need a pickup? Usually it is more economical to rent a vehicle, use a trailer, or pay for delivery instead of buying a vehicle based on an occasional use.

Study the Fuel Economy Label on the vehicles you are considering

All new cars must display a mileage performance label that lists both the estimated city and highway mpg. Compare the fuel economy of the vehicle you are interested in with that of other similar-sized vehicles. To help you with this comparison, you can get the Fuel Economy

Table 11-1 - U.S. Department of Energy (DOE) recommendations for appropriate fuel-efficient vehicle selection.

Transportation Characteristic	Preferred Vehicle Characteristic
Predominantly highway driving	Automatic transmission cruise control
Predominantly city driving	Manual transmission
Predominantly driver-only (little driving with multi-passengers)	Smaller, lighter vehicle/engine Consider renting for infrequent trips
Minimum cargo capacity needs	Smaller, lighter vehicle/engine Consider renting for infrequent cargo carrying capacity needs
Predominantly warm climate operation	Light exterior and interior colors to reduce heat buildup and air conditioning needs
Predominantly cold climate operation	Flow through ventilation rather than air conditioning

Guide (EPA Gas Mileage Guide) by writing Fuel Economy Guide, 1617 Cole Blvd., MS 1633, Golden, CO 80401 or access the website at www.fueleconomy.gov .

Consider options carefully

When considering a new vehicle, assess your transportation needs carefully. Table 10-1, from the U.S. Department of Energy, lists a number of transportation characteristics and corresponding energy considerations.

Fuel Efficiency Standards (CAFÉ)

In 1975 the Energy Policy and Conservation Act established corporate average fuel economy (CAFÉ) standards for new vehicles. These new standards were the result of the Arab oil embargo of 1973-1974 and the tripling in the price of crude oil, which brought the fuel inefficiency of U.S. automobiles into sharp focus. The current standard is 27.5 mpg for passenger automobiles and 20.7 mpg for light trucks, which includes sport utility vehicles (SUV).

Increased fuel efficiency standards will save consumers money at the gas pump, cut harmful vehicle emissions, and reduce our dependence on foreign oil.

Alternative Transportation

Take public transportation

A transit bus with as few as seven passengers is more energy-efficient than the average commuter car, on a passenger-miles per gallon basis. Fully loaded, a transit bus is six times as energy efficient. A fully loaded rail transit car is 15 times as energy efficient as the average commuter vehicle.

Carpool to work

Commuting to and from work accounts for one-third of all private auto mileage. According to the book, *50 Simple Things You Can Do to Save the Planet*, carpooling just eight miles each way will save about 2,500 auto miles per person every year.

Table 11-2 includes a list of currently operating Rideshare programs in Virginia. For more information on ridesharing, call the Virginia Department of Transportation at 1-800-693-RIDE.

Walk or bicycle instead of driving

Walking or bicycling is the ultimate energy saver, and it offers the added benefit of keeping you in shape.

Alternative Fuels and Vehicles

Alternative fuels

Transportation is responsible for more than 67% of the oil that we use in the United States. Data from the U.S. Federal Highway Administration indicates that the average car or truck emits more than 600 pounds of air pollution each year and this includes carbon monoxide, methane, nitrous oxide, and particulate matter – all of which contribute to smog and a wide variety of significant

Table 11-2 - Rideshare programs in Virginia

Program	Service Area	Telephone Number
Ridefinders	Richmond area	(804)643-RIDE 1-800-693-RIDE
Commuter Connections	Washington Metro	1-800-745-RIDE
Traffix	Tidewater area	1-800-700-RIDE
Ride Solutions	Roanoke, Salem, Vinton	(540)342-9393 1-866-260-2153

health problems. Vehicles also emit greenhouse gases due to their combustion of fossil fuels. These gases such as carbon dioxide, methane, hydrocarbons, and nitrogen dioxide contribute to global warming. According to the Environmental Protection Agency (EPA), 82% of U.S. greenhouse gas emissions consist of carbon dioxide that is caused by the combustion of fossil fuels. So common sense dictates that reducing vehicle emissions and developing and using alternative fuels is a prudent and necessary course that will reduce air pollution, global warming, and health problems.

Alternative fuels burn cleaner, produce lower emissions, and most often are renewable fuels that are replenished naturally. Alternative fuels that are in use today include ethanol, biodiesel, methanol, natural gas, propane, electricity, and hydrogen.

Ethanol: Ethanol is an alcohol usually made from corn and is the most widely used alternative fuel in America. Ethanol powered vehicles have lower carbon monoxide and carbon dioxide emissions than gas powered vehicles. Ethanol is also good for performance – pure ethanol is 98 octane! The main disadvantage of ethanol is that it has less energy per gallon than gasoline. Ethanol is blended with gasoline normally in a 90:10 mixture – 90% gasoline and 10% ethanol. Many production cars (see your owner's manual) can use this "gasohol" mixture. Using pure ethanol requires modification to the engine and fuel system.

Biodiesel: Biodiesel is a fuel that is primarily made from several types of oil – recycled cooking oils, soybean oil, and animal fats. This fuel is normally used as a blended fuel consisting of 20% biodiesel and 80% petroleum diesel. Over 30 million gallons are produced in the U.S. annually but it is currently not available to the general public. Federal, state, and transit fleets and some tourist boats are the primary users of this fuel.

Methanol: This is another alcohol fuel that is produced from natural gas and biomass (plants, wood, etc.) and is blended with about 15% gasoline to make a fuel called "M85". Methanol powered vehicles emit smaller amounts of hydrocarbons, particulate matter, and nitrogen oxides than gas powered vehicles. Like ethanol, methanol gives good performance (100 octane), has less energy/gallon than gasoline, and requires engine modifications to use as M85. There are some bus fleets currently in operation that are fueled entirely with methanol – and Indianapolis racers use methanol!

Natural Gas: Natural gas is a clean burning fuel, domestically produced, that emits significantly cleaner emissions than other comparative fossil fuel vehicles. It is used as compressed natural gas (CNG) or liquefied natural gas (LNG). There are over 100,000 natural gas powered buses in America and almost 20% of new buses are built to use natural gas as a fuel.

Propane: Propane is actually liquefied petroleum gas (LPG) and is a byproduct of natural gas and oil processing. Propane emissions are significantly cleaner than gasoline and it is a readily available fuel. There are fueling stations in all states and almost 300,000 propane powered vehicles in the U.S.

Electricity: Electric vehicles use batteries to store the electricity that powers the vehicle and need to be recharged periodically. Emissions from an electric vehicle are essentially zero, but producing the electricity necessary to power the vehicles may come from fossil fuel powered generation. There are over 7,000 electric vehicles on the road today in the U.S. If the electricity to power electric vehicles is coming from a renewable energy source – wind, solar – then the electric car is clean in every way.

Hydrogen: Hydrogen is an element that is found in organic matter, mainly in hydrocarbons that make up many of our other fuels – gasoline, methanol, and propane. Hydrogen, like electricity, must be manufactured. This can be done by using heat to separate hydrogen from the hydrocarbons or by using electricity to separate the hydrogen in water. Most hydrogen is manufactured from natural gas. The only combustion product of hydrogen is water, so hydrogen as a fuel source produces practically no harmful air pollutants. Hydrogen is currently being used as the fuel source for fuel cell powered vehicles.

Alternative Fuel Vehicles

Many auto manufacturers produce and sell alternative fuel vehicles – cars, light and heavy duty trucks, buses, and even boats. Many of these are sold as fleet vehicles but some are also part of the mainstream automobile market.

There are at least two alternative fuel vehicles that

should be of particular interest to any consumer.

Hybrid Vehicles: In 2000, Honda and Toyota began selling hybrid cars – the Toyota Prius and the Honda Insight. Honda has come out with a hybrid version of their very popular Civic and the Ford Motor Company will deliver the first hybrid SUV in 2004. Hybrid vehicles combine an internal combustion engine with an electric motor and can achieve about twice the fuel economy of conventional vehicles. They are not zero emission vehicles but they emit about a third to one-half the amount of greenhouse gases emitted by conventional gas powered vehicles.

Hybrid vehicles are powered by both an engine and an electric motor, and include a battery storage system that is large enough to continue providing power to the electric motor under most driving conditions. Because the batteries are charged by the engine and by the regenerative braking - generating electricity while braking the car - hybrids do not need to be recharged at a recharging station. Hybrids are very efficient because they use a small engine for cruising – when a lot of power is not needed – and they boost power with the electric motor during acceleration. This technique also gives good performance. The future of hybrids may lie in replacing gasoline as the combustion fuel source with renewable energy sources like ethanol or methanol – thus providing a clean, efficient, car powered by renewable fuels.

The hybrid vehicles now on the market are not truly alternative fuel vehicles in that they still use gasoline. They do, however, use much less of it.

Fuel Cell Vehicles: The fuel cell is a device that converts the chemical energy of a fuel into usable electricity without combustion. Any hydrogen rich material – natural gas, methanol, ethanol, hydrogen – can serve as a source of hydrogen for fuel cells. Fuel cells have similarity with batteries in that they produce a direct current by means of an electrochemical process but unlike batteries they store their reactants externally and operate continuously as long as they are supplied with fuel. Because they produce only water vapors as emissions, fuel cells are perfect power sources for transportation.

Many major automakers have manufactured direct hydrogen fuel cell systems that have significant potential to compete with internal combustion engines by as early as 2010. No fuel-cell powered vehicles are on the market today.

Energy Tips and Recommendations

1. Pay attention to how you operate your vehicle – smart driving can save money and minimize unnecessary exhaust emissions. Observe speed limits, minimize idling to warm up your car, avoid quick acceleration, anticipate traffic, and use cruise control in light highway traffic.
2. Proper maintenance of a vehicle can save over 10% in fuel use. A well maintained car would operate more efficiently. Keep your car tuned up, maintain proper tire pressure, keep your vehicles front end aligned, use radial tires, change your oil regularly, and don't carry extra weight.
3. When buying a new vehicle, choose a fuel-efficient one. Study the Fuel Economy Label on any vehicle you are considering for purchase.
4. Avoid driving all the time. Take advantage of public transportation, carpooling, Rideshare programs in your area, and walk or bicycle when possible.
5. Consider the use of alternative fuels in your vehicle. They burn cleaner and produce less pollution than gasoline.
6. Check out Hybrid vehicles. They get great gas mileage and their emissions are as much as 50% cleaner than conventional automobiles.